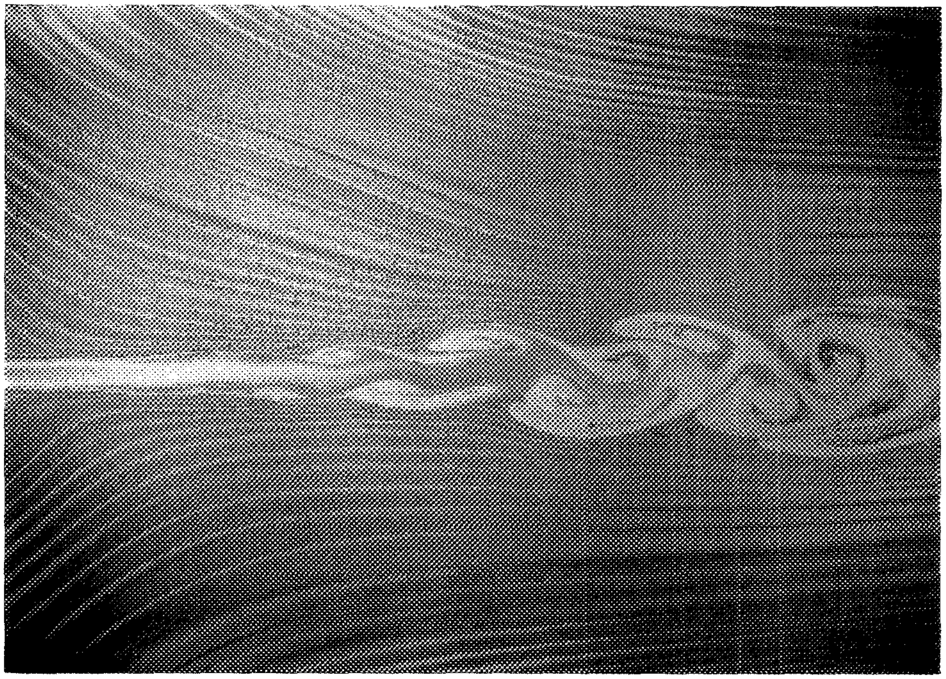

Figure 1

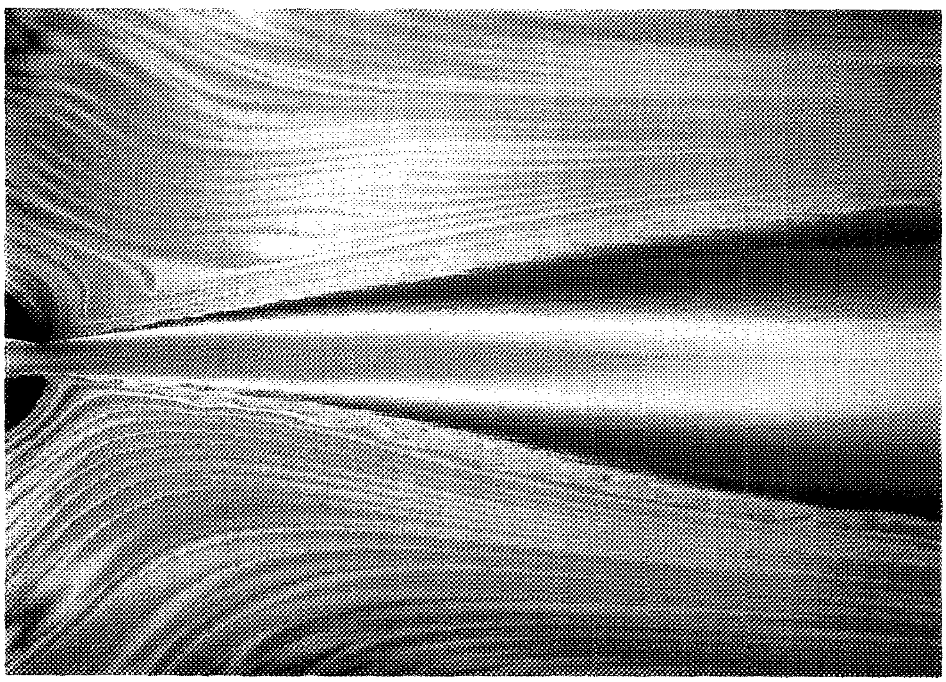

Figure 2

FLOW STUDIES OF A TWO-DIMENSIONAL LIQUID FILM JET

M. Gharib and P. Derango
(University of California, San Diego)

The above images represent a two-dimensional jet produced in a soap film tunnel. The tunnel consists of a frame in which one end is positioned in a diluted soap mixture and the other end is subjected to a film-pulling mechanism. In our device the pulling mechanism is provided through the contact action of a two-dimensional water jet. The two-dimensional jet of higher surface tension is directed at a small angle to the soap film surface at the downstream end of the tunnel. The pulling effect of the high momentum jet results in a uniform two-dimensional motion of the suspended soap film in the frame. Once the two-dimensional flow of the thin film ($\sim 1\ \mu$ thick) starts in the frame, various objects can be placed in the test segment of the frame to study their associated two-dimensional flow fields. By imposing certain geometries on the boundaries of the frame, various shear flows such as jets or two-dimensional mixing layers can be produced.

The interference colors in the above images represent isovelocity (isothickness) regions. The two-dimensional jet in Fig. 1 has a centerline velocity of 140 cm/sec with a corresponding Reynolds number of 2000. Figure 2 shows the same jet, but the jet fluid has a lower surface tension than the ambient fluid, which results in a large growth rate for the jet.